INSTRUCTION MANUAL

The

Model RF-P

Marka-Sweep

KAY ELECTRIC COMPANY

14 Maple Ave., Pine Brook, N. J.

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INSTRUCTION MANUAL

MODEL RF-P MARKA-SWEEP

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SEE ADDENDUM
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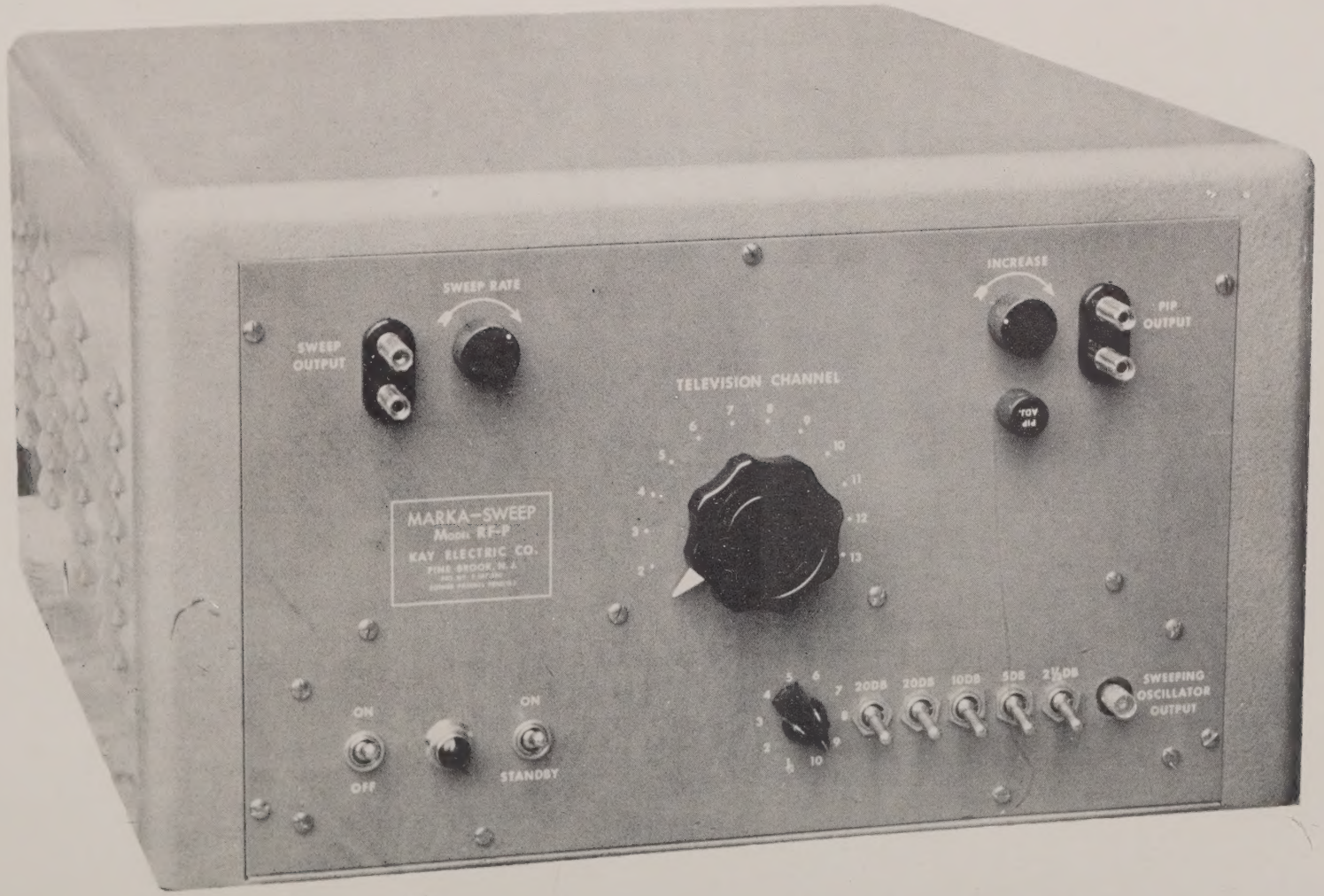

THE MODEL RF-P MARKA-SWEEP

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SECTION I: Description

The MODEL RF-P is a TV alignment instrument designed for use with an oscilloscope in defining the bandpass characteristics of RF amplifiers. It provides up to 15 mc of frequency sweep centered about each of the twelve TV channels and simultaneously generates "pip" type markers at each of the accompanying picture and sound carrier frequencies. The RF-P employs a manually-operated rotary switch as a "Channel Selector", and develops "pips" which are independent of the amplifier circuits under test.

SECTION II: Features

The MODEL RF-P produces a linear swept signal on all TV channels. The channel selector switch automatically selects the correct center frequency and the proper picture and sound carrier markers. The sweep system is all electronic, with the oscillator being frequency modulated by varying the permeability of the core of the coil. The sweep signal is a symmetrical sawtooth, the negative going portion being utilized to disable the oscillator and produce a bright zero level baseline on the oscilloscope display.

All markers are crystal positioned and of the pulse type, being fed directly to the vertical terminals of the oscilloscope. Markers of this type are completely independent of the circuit under test, and neither cause overloading during alignment nor disappear in traps or regions of low amplification. The mark lever is adjusted by an independent control, which allows setting convenient mark heights regardless of the level of the frequency response display.

The MODEL RF-P unit is carefully isolated from its own electronic regulated power supply as well as from the power line source. A shield box completely encloses the RF unit, independent of the cabinet.

The RF-P is constructed as a main chassis including sweep circuits and pip circuits, and three sub-chasses comprising a 12 channel RF sweeping oscillator, a 12 channel crystal oscillator, and a broad band, shielded attenuator. Any of these last three units may be obtained prealigned from the factory as replacement parts.

SECTION III: General Circuit Description

The basic circuits of the MARKA-SWEEP, MODEL RF-P, (schematic diagram, Fig. 4) are shown in simple block diagram in Fig. 2. In addition to a regulated power supply, they are comprised of:

1. A wide-band sweeping oscillator
2. A crystal controlled local oscillator
3. An RF mixer
4. An IF crystal bridge and detector
5. An audio amplifier
6. A pip generator

The sweeping oscillator operates on fundamental frequencies and employs two separate 12AT7 dual triodes for the low (V8) and high (V9) television bands. Utilizing a variable permeability technique, the oscillators are frequency modulated by means of an amplified sawtooth voltage generated in a 6J6 (V6) multivibrator circuit. This sawtooth voltage is used not only to develop the frequency sweep but also to

provide time-base sweep voltage for the horizontal axis of the oscilloscope. RF output from the sweeping oscillators is fed through a switched and variable RF attenuator and made available at the SWEEPING OSCILLATOR OUTPUT terminal on the front panel.

The "local oscillator" consists of a twelve-channel crystal-controlled oscillator and multiplier circuit, a germanium crystal diode harmonic generator circuit, and a tuned grid, tuned plate twelve channel RF amplifier. Crystal-controlled carriers are generated in a 6BH6 (V10) oscillator using twelve switched quartz crystals ground to sub-multiples of a frequency midway between the picture and sound carrier frequencies of each channel. These crystal frequencies are doubled or tripled (low and high bands respectively by means of the 6BH6 tuned plate circuits and further multiplied in a 1N34 germanium crystal diode. The desired signal frequencies are then selected and amplified in a final sharply tuned stage of RF amplification. (6AK5, V11).

In developing the marker "pips", signals from the local oscillator and the sweeping oscillator are heterodyned in a 12AT7 RF mixer (V12) and passed on through a 2.25 mc tuned circuit to a crystal bridge (V1 and V2, 6AG5). This bridge, consisting of a quartz crystal and an LC circuit tuned to the crystal frequency, is resonant at 2.25 mc. With this arrangement, the system functions as a superheterodyne receiver with no image rejection. As the frequency of the sweeping oscillator passes through each of the two desired frequencies (picture and sound carrier), a "trigger" voltage is obtained from the bridge circuit. This voltage, detected in a 1N34 germanium diode and amplified in a 6J6 (V3) audio amplifier, is then used to trigger a 12AT7 (V4) "slave" multivibrator whose output is brought out to the PIP OUTPUT terminals on the front panel.

SECTION IV: Description of Controls

A. Panel Controls and Connectors

1. On-Off Toggle Switch (S-7) is the power switch in the primary of the power transformer.

2. Pilot Light (I-1) is lighted when power is on.

3. STANDBY Switch S-8 is an ON-OFF Switch which turns off the B supply to all tubes. In later units, this switch passes the sweep tube (6J6) in order to maintain a horizontal scope trace.

4. Television Channel Switch (S6) is the rotary switch which is used to select the desired output frequency range. Additional segments of this switch select the proper marker frequencies as well as make necessary circuit adjustments to maintain sweepwidth and linearity over all channels.

5. Sweep Output Terminals (J3) make available the sawtooth sweeping voltage for connection to the horizontal terminals of the test oscilloscope.

6. Sweep Rate Control (R-60) allows variation of the repetition rate of the sawtooth around 60 cycles, a 60 cycle synchronizing voltage allows easy synchronization of the sweep rate with the power line, to make a stable picture possible in spite of hum in the system under test. Asynchronous operations allow simple detection of such hum.

7. Pip output terminals (J1) make available the pulse type marker signals

for connection directly to the vertical terminals of the test oscilloscope.

8. Pip Amplitude Control (R-100) allows adjustment of the voltage level of the marker pips, between zero and approximately 50 volts peak (positive).

9. Pip Adj. Control (R26) adjusts the input trigger level to the pip forming multivibrator. If this control is set too low, only one or possibly no marks will appear. If too high, the pip shapes may be distorted, or multiple pips may appear. The control should be set slightly above the minimum setting necessary for the appearance of both marker pips on all bands.

10. Sweeping Oscillator Output (J2) is the output terminal for the sawtooth swept RF. A maximum voltage of approximately 0.5 volts rms across the 70 ohm (unbalanced) output impedance is available. This signal may be reduced by use of:

11. Switched Attenuators: 20 db (S1), 20 db (S2), 10 db (S3), 5 db (S4) and 2-1/2 db (S5), as well as

12. Variable Attenuator (R24A and R24B) which allows continuous but uncalibrated attenuation over a voltage range of approximately 2 to 1.

B. Chassis Controls

1. Pip multivibrator bias control (R26) is reached through the hole on the right hand side of the Marka-Sweep cabinet and adjusts the operating point of the pip multivibrator. In adjustment, this pot should first be set for free-running of the multivibrator, i.e., pips appearing at random over the length of the oscilloscope response. The pot should then be backed off to a point where the random pips disappear. To check the setting of this control, adjust the setting of the PIP ADJ control on the front panel until two stable pips appear. The most favorable setting of R26 is at that point of adjustment which permits the greatest range of control of the PIP ADJ pot. between the condition of no pips and multiple pips.

2. Sweep Width Control (R88) is reached through the hole on the left hand side of the cabinet and will adjust the sweep width on all channels. This control should be set to provide a sweep of 15 mc plus or minus 2 mc. If the control is set for frequency sweeps widely different from 15 mc, it will be necessary to change the sweep linearity resistors on the channel selector switch to restore flat amplitude output. It will also be necessary to recenter each band using the coils and trimmer condensers provided. It should be pointed out that this control will affect the centering of the bands. It should, however, be used only for establishing sweep width. For all but small adjustments of center frequencies, the designated capacitors and coils should be used.

SECTION V: Operating Instructions

A. Plug the power cord into a source of 105-125 volts AC at 50-60 cycles, turn the Marka-Sweep on, and allow to warm up for about ten minutes.

B. Make cable connections as follows (Note sketch below):

1. Connect 70 ohm output cable (with BNC connectors) between Sweeping Oscillator Output terminal and receiver (if input is 70 ohm) or impedance matching box and thence to receiver (if input is 300 ohm).

2. Connect Sweep Output terminals to Horizontal terminals of indicator oscilloscope. Either shielded or unshielded lead may be used.

3. Connect Pip Output terminals to vertical terminals of oscilloscope. Shielded lead is recommended here. It may be found necessary to place an isolation resistor of 10,000 ohms or so in series with this lead right at the oscilloscope. The need for this isolation can be determined later by observing the effect on the displayed response of connecting and disconnecting this pip output lead. Change in shape of response curve indicates desirability of isolation, whereas mere change in level is unimportant.

4. Connect video detector output voltage to vertical input of oscilloscope through a filter network. Shielded cable is desirable here.

C. Operation

1. Set Television Channel Switch of Marka-Sweep and TV receiver input to same channel.

2. Adjust Marka-Sweep attenuator controls until typical response curve is displayed on oscilloscope.

3. Adjust Sweep Rate Control on Marka-Sweep until oscilloscope pattern is stationary.

4. Adjust control beside Pip Output terminals until markers are of convenient height.

Instrument is now ready for use, and will indicate overall response curve of receiver under test, as well as marking location of sound and picture carrier frequencies on the response curve.

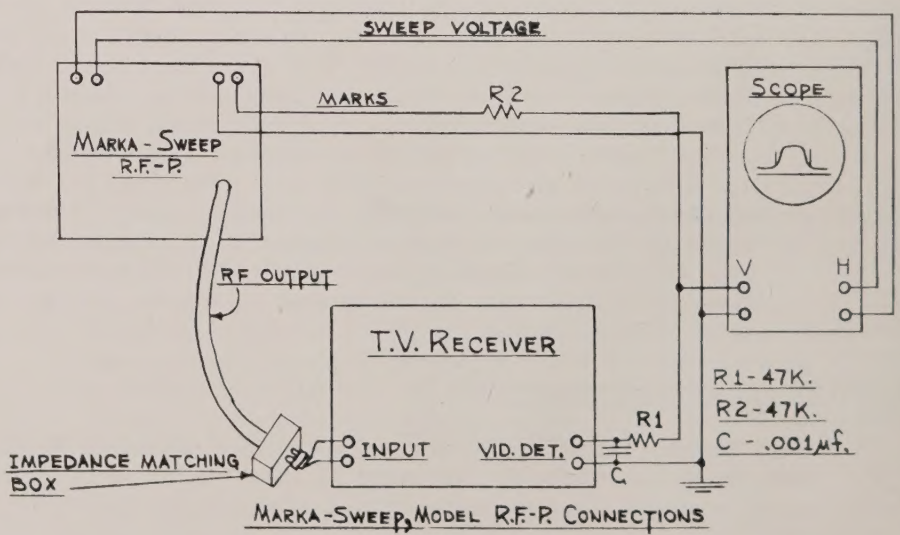

Fig. 1

SECTION VI: Notes on Service and Maintenance

A. General

The schematic diagram (Fig. 4) includes voltage figures for principal points in the circuit. Measurement of voltages on the unit with a vacuum tube voltmeter will aid in tracing difficulty experienced in operation.

In order to assist in isolating troubles, several possible operating difficulties will be listed below, together with the tubes included in Fig. 4 which, together with associated circuits, could contribute to the particular type of difficulty.

1. Scope indicates horizontal sweep voltage but no RF output:

   A check should be first made to determine, by use of a separate signal source, whether the receiver or tuner in use is passing RF signal. If the receiver is operating correctly, then the circuits associated with V8 (low band), V9 (high band) and V7 should be checked.

2. RF output indicated but no indication of sweep:

   Investigate circuits associated with V6 and V5.

3. RF output, but no blanking:

   Check D1 germanium diode.

4. Deterioration of amplitude flatness:

   Replace V7, check V7 circuit. The flatness response on each channel is controlled by the sweep linearity resistors on S6e, front wafer on rear sub-chassis. These may be varied if required. In replacing these resistors, it should not be necessary to depart very much from the original value.

5. Deterioration of frequency linearity:

   Replace V5, check V5 circuit.

6. Difference in output between high band and low band:

   Replace lower output oscillator, V8 or V9. The output coupling of the low band oscillator utilizes R52, R53 and C20. C20 may be adjusted to equalize outputs of the high and low bands. It should, however, be adjusted at the maximum end of its range so as to preserve the flatness response of the low frequency channels. In some cases, where a major replacement has been made in one of the oscillator circuits, it may be helpful to increase or decrease the value of R53. The range of adjustment is from 150 ohms to 330 ohms.

7. Marks either do not appear or appear with additional Spurious Marks:

   Make adjustment recommended in Section IV-B-1 above.

8. Marks not positioned at center of Oscilloscope Display:

   An adjustment for correcting this in the case where the marks on all channels are off in the same direction is discussed in Section IV-B-2 above.

Additional information concerning this case and the case where marks are off center in some channels but not in others is discussed in Section C below.

If the marks cannot be made to appear by the adjustment mentioned in Section VI-A-3 above, the circuit of tubes V10, V11, V12, V1, V2, V3, V4 should be investigated.

To assist in locating various portions of the circuit, a photograph of the bottom of the chassis is included in Fig. 3. Tube types, tube location, schematic tube number and tube function in the circuit are indicated.

B. Adjustments Where Only One Mark Appears.

When only one mark appears on one or more channels and two correct undistorted marks cannot be obtained by the adjustment outlined in Section IV-B-1 above, the following procedure should be undertaken:

1. Connect the vertical input of an oscilloscope to the junction between C12 and R17 as shown on Figs. 4 and 3 attached. This point is brought out to a test jack on the top of the chassis (next to V4). Connect the horizontal input of the oscilloscope to "Sweep Output" on the front panel of the RF-P.

2. Set the selector switch on the RF-P to each channel on which only one mark can be made to appear.

3. On each channel set in (2) above, adjust the proper tuning coil in the plate of V11 as indicated on Fig. 6b for the channel under adjustment. This coil should be tuned for equal height peaks on the oscilloscope.

4. If equal height of peaks cannot be obtained by adjustment in (3) above, adjust proper coils in grid of V11 as indicated on Fig. 6b for equal height peaks. After adjusting coils as indicated, liquid wax should be applied to the tuning screws adjusted to hold them in place.

5. Only small readjustment of the tuning slugs - 2 or 3 turns should be necessary in most cases. If very large changes in tuning are made, some interaction between the plate tuning circuits of channels 2, 3 and 4 on the one hand and channel 13 on the other may occur. If this condition appears, detune the low band channels to favor channel 13. Any necessary readjustments of channels 2-4 may then be made with grid tuning coils.

6. After undertaking steps 1 to 4 above, carry out adjustment in Section IV-B-1 above.

C. Procedure for Alignment of Marks

1. Discussion of Mark Generating Circuits.

The marker pips in the RF-P are generated by use of CW signals obtained from crystal oscillator V10. Crystals X1 through X12 are sub-harmonics of the frequency center between picture and sound carrier on each TV channel. These crystals are successively switched in the circuit by the channel selector. The sub-harmonics are multiplied, amplified and selected by the load circuit of V10, D2 and V11. The CW center frequency is fed to pin 2 of V12. The sweep voltage is fed to pin 7 of V12. The plates of V12 are in parallel and loaded

with a circuit tuned to 2.25 mc. When the sweep is 2.25 mc below the CW from V11 and 2.25 mc above the CW, the plate load of V12 passes energy. These two pulses of energy are fed through a second IF stage (V1) whose plate is also tuned to 2.25 mc. Tube V2 differentiates this energy to narrow the pulse and introduce frequency calibrating energy from crystal X13. Crystal D4 detects the envelope of the energy and V3 amplifies it. The pulses are now formed but too broad for use. The output of V3 is used to trigger a slave multivibrator V4 whose output is the final pulse markers. R20 controls the amount of drive to V4 and is the PIP ADJ. pot. on the front panel.

2. Frequency Alignment of Marks

When it is impossible to obtain correct marks by the adjustments discussed in IV-B-1 above, or when the frequency of the marks is to be checked, the following procedure should be carried out.

1. Connect vertical input of an oscilloscope to the junction between C12 and R17 in the grid of V3 as shown on Fig. 4. Connect the horizontal input of the oscilloscope to "Sweep Output" on the front panel of the RF-P.

2. Spread the horizontal sweep of the oscilloscope until the marking pulses can be observed in detail.

3. Place a 1000 ohm resistor across C41 shown on Figs. 4 and 3 attached.

4. Adjust C9 (See Fig. 4 and 3 attached) to a point about 25% of max.

5. Adjust C2 (Fig. 4 and 3 attached) until the crystal beat note is centered in the peaks of the two pips in the scope. This beat note is a "birdie" and the zero beat should be in the center of each pip.

6. Remove the 1000 ohm resistor from C41 and peak C41 for maximum pip response on the oscilloscope after the horizontal sweep has been returned to normal.

7. Mix the output of the Dual Mega-Marker Sr. or other source of TV carrier signal through an isolating resistor of 1000 ohms connected to pin 7 on V12. Switch the channel selector of the Dual Mega-Marker Sr. or other source and the RF-P to the same channel or correct frequency. Connect the oscilloscope vertical input to the pip output on the panel of the RF-P. Adjust C9 for coincidence of the center of the birdie from the Dual Mega-Marker Sr. or other source and the leading edge of the RF-P pips.

NOTE: The leading edges of the pips from the RF-P are at the correct frequency.

D. Adjustment of Center Frequency of Each Channel.

The center frequencies of channels 2 through 13 in the RF-P are adjustable by trimmer capacities. Channel 13 is adjusted at the factory by changing the spacing between turns on L4. Since L3 and L4 are waxed in place at the factory, it should not usually be necessary to disturb their positions. C66 through C71 are all in parallel when the switch is at channel 7. One condenser is thrown out of the circuit each time the channel switch is moved from channel 7 toward channel 13. For this reason, adjustment of center frequency of any channel above 7 affects all channels

between 7 and the channel under adjustment. Condensers C78 through C83 are individually switched in and out and for this reason there is no interaction.

1. Adjustment of Center Frequency of Channels

1. Connect oscilloscope vertical input to the pip output of the RF-P. The horizontal input of the oscilloscope to the sweep output of the RF-P.

2. Switch the RF-P to channel 13. After a 20-minute warm-up, the B+ control on the power supply can be adjusted to provide small shifts in center frequency. In most cases, it is advisable to center the sweep by opening or closing the turns of the high band RF oscillator coil.

3. Adjust the RF-P channel switch successively through the high band channels and center the marks on the 'scope by adjusting the condensers indicated. The condenser for each channel is indicated by number on Fig. 6a The condensers are marked "Centering Adjustments of Sweeping Oscillator".

4. Switch to channel 6. Center the sweep by opening or closing the turns of the low band RF oscillator coil.

5. Switch through the low band channels and center by use of the trimmer condensers.

PARTS LIST

MARKA-SWEEP MODEL RF-P

Tubes:

V1	6AG5	V7	6SN7
V2	6AG5	V8	12AT7
V3	6J6	V9	12AT7
V4	12AT7	V10	6BH6
V5	6V6	V11	6AK5
V6	6J6	V12	12AT7

Resistors: (All resistors are 1/2W unless otherwise specified).

R1	22K	1 W
R2	1000	
R3	100K	
R4	120	
R5	100K	
R6	120	
R7	120	
R8	1000	
R9	100K	
R10	1000	
R11	10K	
R12	22K	
R13	120	
R14	30K	
R15	30K	
R16	1000	
R17	47K	
R18	100K	
R19	120	
R20	500K	Pip Adj. Pot. (external)
R21	220K	
R22	47K	
R23	1 meg.	
R24	100K	
R25	10K	
R26	10K	Pip Adj. Pot. (internal)
R27	56K	1W
R28	500K	Pip Amplitude Pot.
R29	47K	
R30	1000	
R31	10	
R32A	100	Ganged Pots. -Var. attenuator
R32B	500	" " "
R33	120	
R34	82	
R35	120	
R36	330	
R37	330	
R38	100	
R39	39	
R40	22	
R41	470	
R42	470	

R43	240 ohms
R44	240 ohms
R45	130 ohms
R46	130 "
R47	82 "
R48	82 "
R49	82 "
R50	82 "
R51	10 "
R52	82 "
R53	240 "
R54	300 "
R55 *	47K - 2W
R56	300 ohms
R57	33K - 1W
R58	1500
R59	1.2K
R60	2.2 meg.
R61	20K
R62	1 meg.
R63 *	
R64 *	
R65 *	
R66 *	
R67 *	
R68 *	
R69 *	
R70 *	
R71 *	
R72 *	
R73 *	
R74 *	
R75 *	
R76 *	
R77 *	
R78 *	
R79 *	
R80 *	
R81 *	
R82 *	
R83 *	
R84 *	
R85 *	

*Values adjusted at factory

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Resistors: (continued)

R86 *		
R87	10K	
R88	500K	Sweep Width Pot.
R89	1.8 meg.	
R90	150K	
R91	3.3 meg.	
R92	3.3 meg.	
R93	220K	
R94	150K	
R95	100K	
R96	100K	
R97	470K	
R98	820K	
R99	3.3 meg.	
R100	100K	Sweep Rate Pot.
R101	4.7K	
R102	1 meg.	
R103	2.7K	
R104	470 ohms	
R105	220 "	
R106	10K - 2W	
R107	56K - 1W	
R108	56K	
R109	1.5K	
R110	4.7K	
R111	120K	
R112	100K	
R113	10K - 2W	
R114	120 ohms	
R115	47K	
R116	1M	
R117	10 ohms	
R118	100 ohms	
R119	100 "	
R120	270K	
R121	68 ohms	
R122	15K	
R123	68 ohms	
R124	330K	
R125	12K	
R126	12K	
R127	1.8K - 1W	
R128	220 ohms	
R129	2K - 1W	
R130	1.8K - 1W	
R131	220 ohms	
R132	82K	
R133	33K	
R134	33K	

*Values are adjusted at factory

Condensers:

C1	10,000 mmf.	500V	
C2	7-45 mmf.		
C3	50 mmf.	300V	
C4	75 mmf.	300V	
C5	1,000 mmf.	500V	
C6	50 mmf.	500V	
C7	.25 mfd.	400V	
C8	20 mmf.	500V	
C9	7-45 mmf.		
C10	390 mmf.		
C11	.25 mf. - 25V - Electrolytic		
C12	.01 mf.		
C13	.002 mf.		
C14	820 mmf.	300V	
C15	33 mmf.	300V	
C16	390 mmf.	300V	
C17	390 mmf.	300V	
C18	.02 mfd.	300V	
C19	1000 mmf.	500V	
C20	7-45 mmf.	500V	
C21	1000 mmf.	500V	- Feed-thru
C22	1000 mmf.	500V	- Feed-thru
C23	20 mf.	500V	Electrolytic
C24	1000 mmf.	500V	Feed-thru
C25	25 mf.	25V	Electrolytic
C26	1000 mmf.	300V	
C27	1000 mmf.	500V	Feed-thru
C28	.05 mfd.	400V	
C29	1000 mmf.		Feed-thru
C30*	3000-5600 mmf.		
C31	1000 mmf.		Feed-thru
C32	.05 mf.		
C33	.01 mf.		
C34	.25 mf.		
C35	.02 mfd.	450V	
C36	.01 mfd.	400V	
C37	.25 mf.	500V	
C38	2000 mmf.	500V	
C39	2000 mmf.	500V	
C40	91 mmf.	500V	
C41	245 mmf.	500V	- Padder
C42	1000 mmf.		
C43	1000 mmf.		Feed-thru
C44	10 mf.		Electrolytic
C45	1000 mmf.		Feed-thru
C46	5 mmf.		" "
C47	1000 mmf.		
C48	1000 mmf.		" "
C49	1000 mmf.		" "
C50	1000 mmf.		
C51	1000 mmf.		
C52	20 mmf.		

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Condensers: (continued)

C53	Special Trimmer Condenser		
C54	"	"	"
C55	"	"	"
C56	"	"	"
C57	10 mmf.	300V	
C58	1000 mmf.	500V	
C59	1000 mmf.	500V	
C60	10 mmf.	400V	
C61	10 mmf.	500V	
C62	1000 mmf.	300V	
C63	1000 mmf.	500V - Feed-thru	
C64	1000 mmf.	500V - "	"
C65	50 mmf.	500V	
C66	500V Special Kay Elec. condenser		
C67	500 V	" "	"
C68	500V	" "	"
C69	500V	" "	"
C70	500V	" "	"
C71	500V	" "	"
C72	1000 mmf.	500V	Feed-thru
C73	1000 mmf.	500V	" "
C74	1000 mmf.	500V	" "
C75	1000 mmf.	500V	" "
C76	1000 mmf.	500V	" "
C77	1000 mmf.	500V	" "
C78	8 mmf.	500V	" "
C79	5 mmf.	500V	" "
C80	1-6 mmf.	500V	
C81	1-6 mmf.	500V	
C82	1-6 mmf.	500V	
C83	3 mmf.	500V	
C84		500V	
C85	3 mmf.	500V	
C86	8 mmf.	500V	
C87	8 mmf.	500V	
C88	1000 mmf.		Feed-thru
C89	1000 mmf.		" "
C90	1000 mmf.		" "
C91	1000 mmf.		" "
C92	1000 mmf.		" "

Coils:

L-1	50 uH.
L-2	Low Band Oscillator Coil
L-3	Low Band Oscillator Coil
L-4	High Band Oscillator Coil
L-5	High Band Oscillator Coil
L-6	50 uH.
L-7	2 uH.
L-8	Channel 2 trimmer
L-9	" 3 "
L-10	" 4 "
L-11	" 5 "

Coils: (continued)

L-12	" 6 "
L-13	" 7 "
L-14	" 8 "
L-15	" 9 "
L-16	" 10 "
L-17	" 11 "
L-18	" 12 "
L-19	" 13 "
L-20	2 uH. Filament choke
L-21	Channel 2 Trimmer
L-22	" 3 "
L-23	" 4 "
L-24	" 5 "
L-25	" 6 "
L-26	" 7 "
L-27	" 8 "
L-28	" 9 "
L-29	" 10 "
L-30	" 11 "
L-31	" 12 "
L-32	" 13 "
L-33	Trimmer Coil
L-34	50 uH.
L-35	2 uH. Filament choke
L-36	2 uH. " "
L-37	Special Slug-Tuned Coil

Crystals:

D1	1N34 Germanium Diode
D2	1N34 " "
D3	1N34 " "
X1 to X12	Channels 2 to 13 Quartz
X13	2250 Kc.

Connectors:

J1	General Radio PIP OUTPUT
J2	I. P. C. #4500 (male) SWEEPING OSCILLATOR OUTPUT
J3	General Radio SWEEP OUTPUT
J4	Jones - POWER SUPPLY CABLE
J5, 6, 7, 11	Dage UG/260/U (male) special
J8, 9, 10	Dage UG/185/U (female) special

Switches:

S1	D. P. D. T. 20 db.
S2	D. P. D. T. 20 db.
S3	D. P. D. T. 10 db.
S4	D. P. D. T. 5 db.
S5	D. P. D. T. 2-1/2 db.
S6a to S6h	Rotary Television Channel
S7	S. P. S. T. On-Off A. C. line
S8	S. P. S. T. ON-STANDBY

MARKA-SWEEP MODEL RF-P

POWER SUPPLY

Fuse:

F1	3 amp.

Pilot Lamp:

I1	#47 Bayonet Type

Tubes:

V1	5U4	V4	6J5
V2	6Y6	V5	6SN7
V3	6Y6	V6	VR150

Resistors:

R1	330K	1W	R9	100	1W
R2a, R2b	51	1W	R10	270K	1/2W
R3	390	1/2W	R11	82K	1W
R4	120K	1/2W	R12	10K	1W
R5	220	1/2W	R13	2700	1/2W
R6	100	1W	R14	120K	1/2W
R7	220	1/2W	R15	82K	1/2W
R8	390	1/2W	R16	82K	1/2W

Condensers:

C-1A	20 uf 500V	C6	1/2 uf 600V
C-1B	20 uf 500V	C7	40 uf 450V
C-2 through		C8	.01 uf 500V
C-4.....not used		C9	1/2 uf 600V
C-5	2 uf 600v		

Potentiometer:

R17	25K	2W	Type J

Transformers:

T1	KP91 Industrial
T2	Industrial Equivalent to Stancor P6308

Chokes:

L1	10 henry	270 ohms	.1 Ampere
L2	10 "	270 "	.1 "

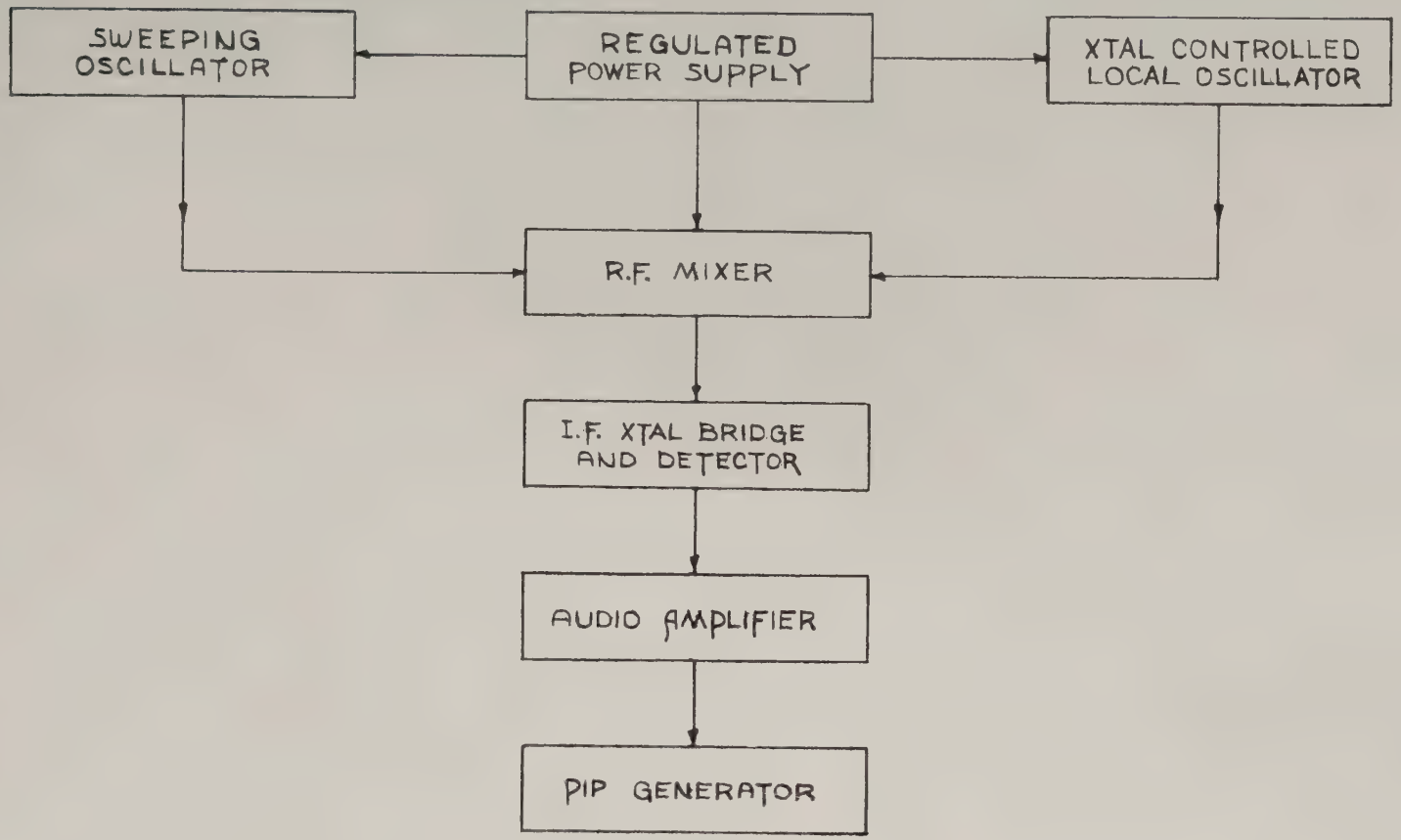


Fig. #2 — SIMPLIFIED BLOCK DIAGRAM OF THE MODEL R.F-P

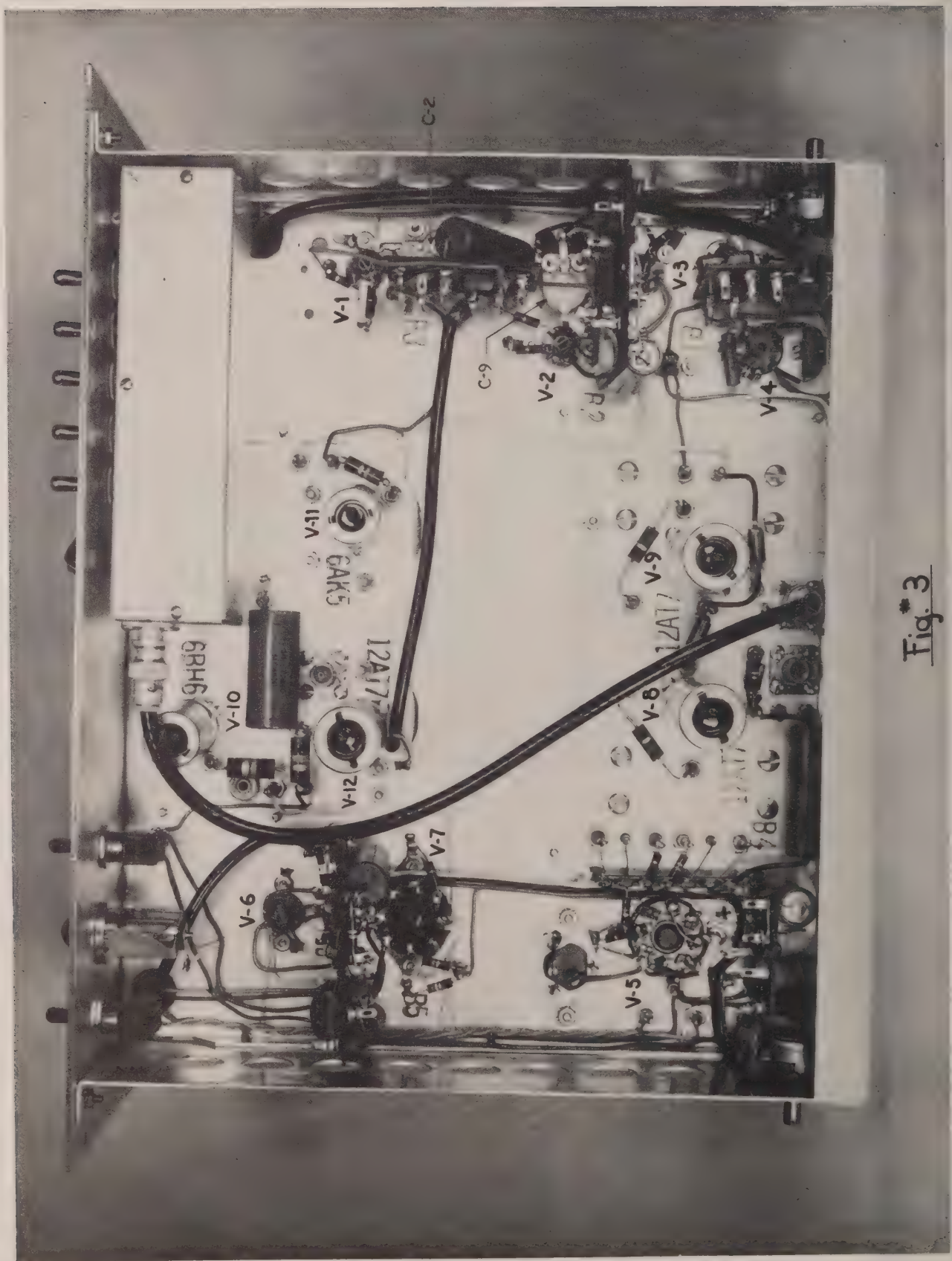
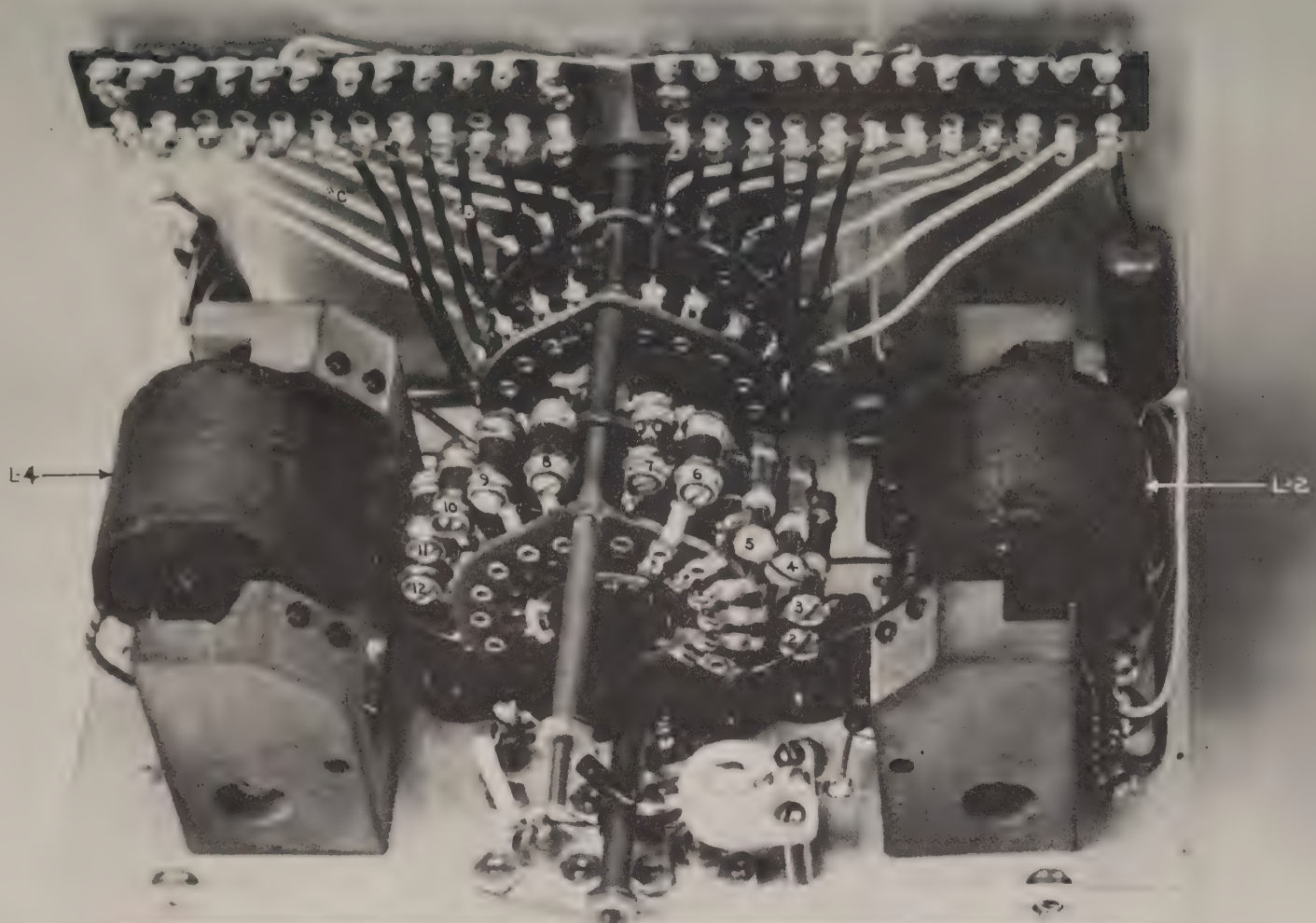


Fig. 3



"A"- CENTERING ADJUSTMENTS OF SWEEPING OSCILLATOR "B"- SWEEP WIDTH; R63 to 74 "C"- SWEEP LINEARITY; R75 to 86

REAR OF CHASSIS

Fig. 6a

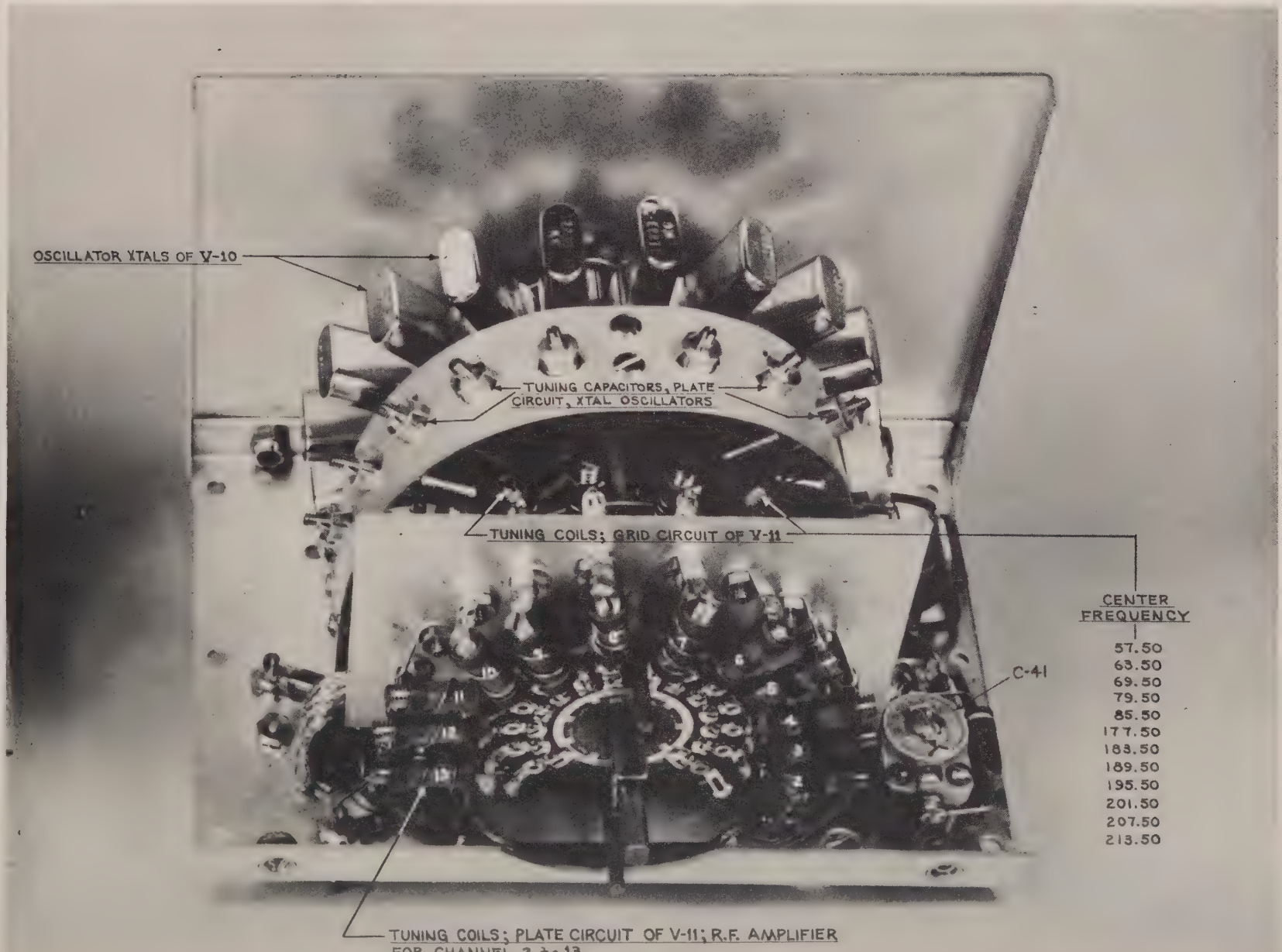
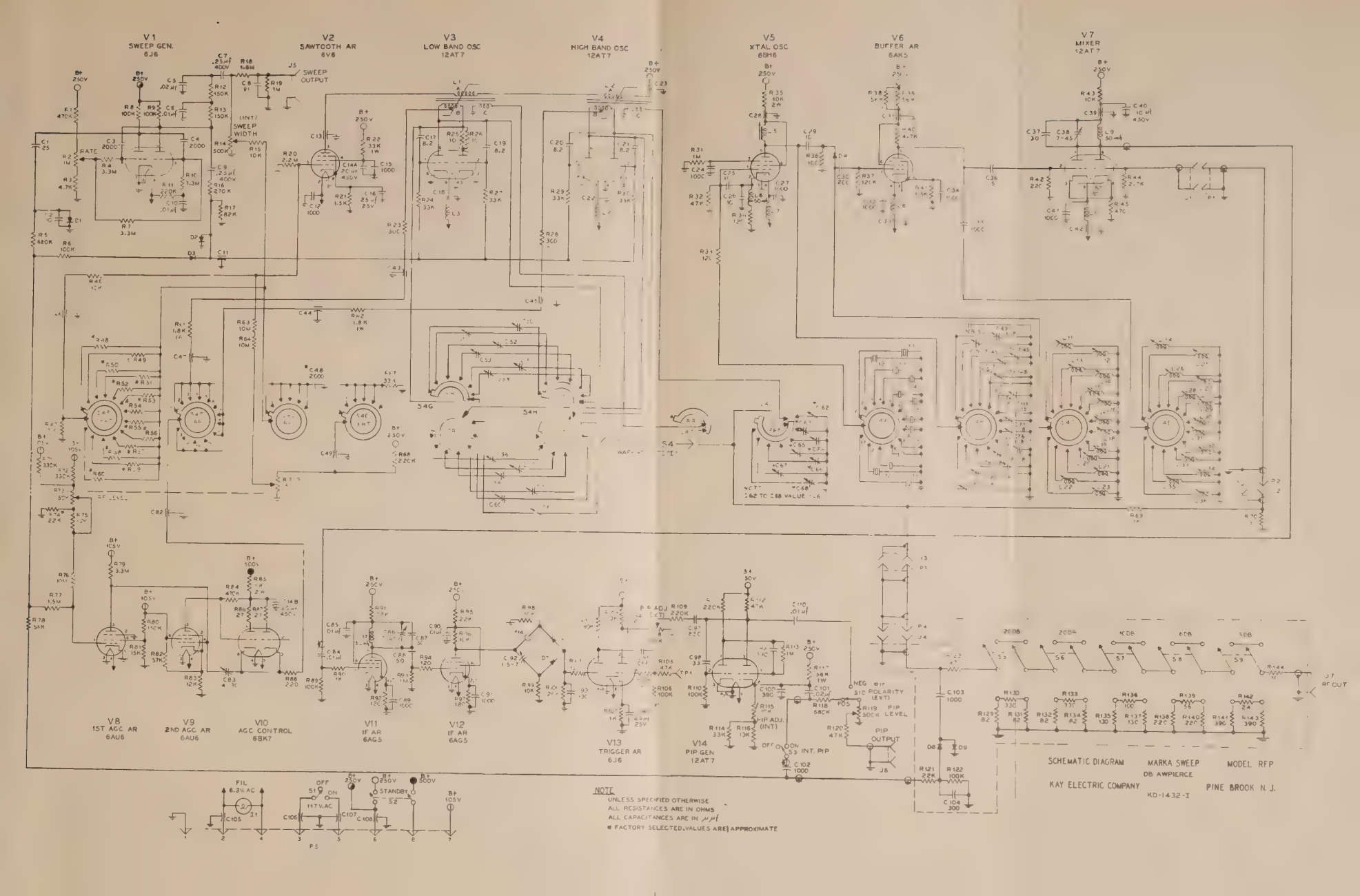

OSCILLATOR XTALS OF V-10
TUNING CAPACITORS, PLATE CIRCUIT, XTAL OSCILLATORS
TUNING COILS; GRID CIRCUIT OF V-11
C-41
CENTER FREQUENCY
57.50
63.50
69.50
79.50
85.50
177.50
183.50
189.50
195.50
201.50
207.50
213.50
TUNING COILS; PLATE CIRCUIT OF V-11; R.F. AMPLIFIER FOR CHANNEL 2 to 13

Fig.* 66


V1
SWEEP GEN.
6J6
V2
SAWTOOTH AR
6V6
V3
LOW BAND OSC
12AT7
V4
HIGH BAND OSC
12AT7
V5
XTAL OSC
6BH6
V6
BUFFER AR
6AK5
V7
MIXER
12AT7
SWEEP OUTPUT
SWEEP WIDTH
RATE
V8
1ST AGC AR
6AU6
V9
2ND AGC AR
6AU6
V10
AGC CONTROL
6BK7
V11
IF AR
6AG5
V12
IF AR
6AG5
V13
TRIGGER AR
6J6
V14
PIP GEN
12AT7
PIP ADJ. (INT)
INT. PIP
PIP OUTPUT
NEG. OR SYNC POLARITY (EXT)
PIP LEVEL
RF OUT
FIL
6.3V AC
OFF
ON
117 V.AC
STANDBY
S1
S2
P5
NOTE
UNLESS SPECIFIED OTHERWISE
ALL RESISTANCES ARE IN OHMS
ALL CAPACITANCES ARE IN μμf
* FACTORY SELECTED, VALUES ARE APPROXIMATE
SCHEMATIC DIAGRAM
MARKA SWEEP
MODEL RFP
DB AWPIERCE
KAY ELECTRIC COMPANY
PINE BROOK N. J.
KD-1432-I

ADDENDA
MODEL RF-P MARKA-SWEEP
IMPROVED CRYSTAL MARKER CIRCUIT

This circuit modification was made to improve the control which the 2.25 mc crystal exerts over the position of the two markers. With this circuit, the crystal is in absolute control of the markers and misadjustment or mistuning cannot alter their position and hence the frequency accuracy.

All Model RF-P Marka-Sweeps shipped from the factory after 7/13/53 incorporate this change. Owners of older instruments can readily convert to the new circuit, since no chassis changes are required, and no new parts are needed other than a few resistors and capacitors and germanium rectifiers to be found in stock in almost all engineering laboratories.

The following notes are given to assist in understanding and adjusting the new circuit; the procedure differs slightly from that given in the instruction book, Section IV. This new adjustment procedure must be followed if the above mentioned absolute control of marker position by the crystal is to be had.

Wiring Notes:

a. The .01 and .001 bypass capacitors added to V2 should be small, low-inductance units suitable for this function and should be located close to the socket pins.

b. The wiring of the plate circuit of V2 should be dressed for low capacitance to ground.

c. The two germanium rectifiers should be reasonably well matched. A difference of not more than 25% in both forward and reverse resistance is desirable, though greater differences will usually operate satisfactorily. The rectifier which is added (D1-A) should be of the same type as the one already in the instrument (Raytheon CK-705). If not available so that some other type must be used, change the rectifier already in the instrument also. The polarities must be series aiding; the two rectifiers generate equal and opposite triggers on capacitive balance, while the resonant response of the quartz comes through as an unbalance signal and forms a trigger at the crystal resonant frequency.

Adjustment Procedure:

a. Connect the vertical input terminals of an oscilloscope to the test jack located at the right rear corner of the chassis.

b. Adjust C9, the balancing capacitor, for minimum amplitude of the developed trigger voltage. The waveform should be approximately symmetrical about the zero axis.

c. Adjust the 2.25 mc tuning capacitors C41 and C2 for maximum response. It is not necessary to shunt C41 as called for with the old circuit.

d. Remove the 2.25 mc crystal from its socket, which unbalances the bridge and allows a large voltage having the waveform of the resonant response of the 2.25 mc amplifier to come through. The two pulses seen should be negative-going. If they are positive, reverse both rectifiers. This poling is chosen to minimize the likelihood of generating marker pips with the crystal removed,

but it has little or no effect upon operation with the crystal in place.

e. Adjustment of the RF circuits (the crystal-controlled oscillators that beat with the swept output to produce the marker beats) is best made with the scope connected as above to the test jack and with the crystal removed. Adjust as in Section IV, Par. B. Do not attempt to make this adjustment with the scope connected to the panel PIP OUTPUT terminals.

f. Replace the 2.25 mc crystal in its socket and connect the scope to the panel PIP OUTPUT terminals so as to view the developed marker pips. Adjust the PIP ADJ control so that markers are formed on all channels but there is no doubling or multiple marker generation. With some 2.25 mc resonator crystals, the waveform of the trigger generated by the crystal is such as to trigger the pip multivibrator more than once. Such cases can usually be greatly improved by connecting a small capacitor, from 200 to 500 μμf, between the second grid (pin 5) ov V3, the trigger amplifier, and ground. A convenient connection point will be found on the terminal board carrying R18 and R19, at the junction of these two resistors. This capacitor removes some of the high-frequency components of the crystal response which tend to cause re-triggering, and the effect is to increase the operating margin of the PIP ADJ control. Too much capacitance will cause a shift of marker position and should be avoided.

ADDENDUM A

The **MARKA-SWEEP MODEL RF-P** recently has been redesigned to incorporate new features l provide improved performance. At the present time a revised instruction book describ- g this new instrument is still in the process of preparation. One additional control, e INTernal PIP switch has been added to the unit. When this switch is in the upper F) position, the markers appear at the separate PIP OUTPUT jack as positive pulse- pe markers. When this switch is in the ON position, they are "negative" keying-pulses perimposed on the sweeping r-f output. This redesign comprises two major changes:

1. Automatic Gain Control Circuit. This circuitry *(V-8, V-9 & V-10)* has been added to insure a flat frequency-vs-amplitude characteristic both within the individual bands and across the entire operating range. A portion of the final r-f output, appearing at the attenuator input, is fed thru the two AGC amplifiers *(V-8 & V-9)* to the AGC control stage *(V-10)* which acts as a variable resistance in the sweeping oscillator B+ lead. Consequently, an increase in the r-f output lowers the B+ on the sweeping oscillator, with a subsequent reduction in the r-f output. An increase in r-f output produces the opposite effect.

   The R-F LEVEL potentiometer controls the bias on the first AGC amplifier and, consequently, the final r-f amplitude. The AGC operation is synchronized with that of the sweeping oscillators.

2. Negative Pip Circuit. The addition of this circuitry allows the operator to use the nine frequency markers either as positive, pulse-type markers, available at the separate PIP OUTPUT jack or as "negative" keying-pulse markers, produced by momentarily disabling the sweeping oscillator as it passes thru each marker frequency.

   The former type of markers have a separate amplitude control and are fed directly to the 'scope; consequently, they are independent of the frequency response of the circuit under test and do not overload its circuitry or disappear in traps. The "negative" markers appear in the sweeping r-f output and thus obviate the need for a separate marker lead. This is particularly advantageous where the 'scope may be located at some distance from the **MARKA-SWEEP**. The "negative" markers are produced by feeding the pips developed at the cathode of the pip generator via INTERNAL PIP switch *S-3*, to the grid of the AGC amplifier. These pips cause the AGC circuit to shut off the B+ momentarily at each marker frequency.

Martin-Sweets

200A POWER SUPPLY

PARTS LIST

(KB 2548-1L)

11/7/57

CAPACITORS

C-1 6μf, 600V, oil-filled
C-2 2 μf, 600V, oil-filled
C-3 0.01μf, 500V, disc ceramic
C-4 0.1μf, 400V, molded paper
C-5a 20μf, 450V, electrolytic
C-5b 20μf, 450V, electrolytic
C-6 1000μμf, 500V, ceramic

TUBES

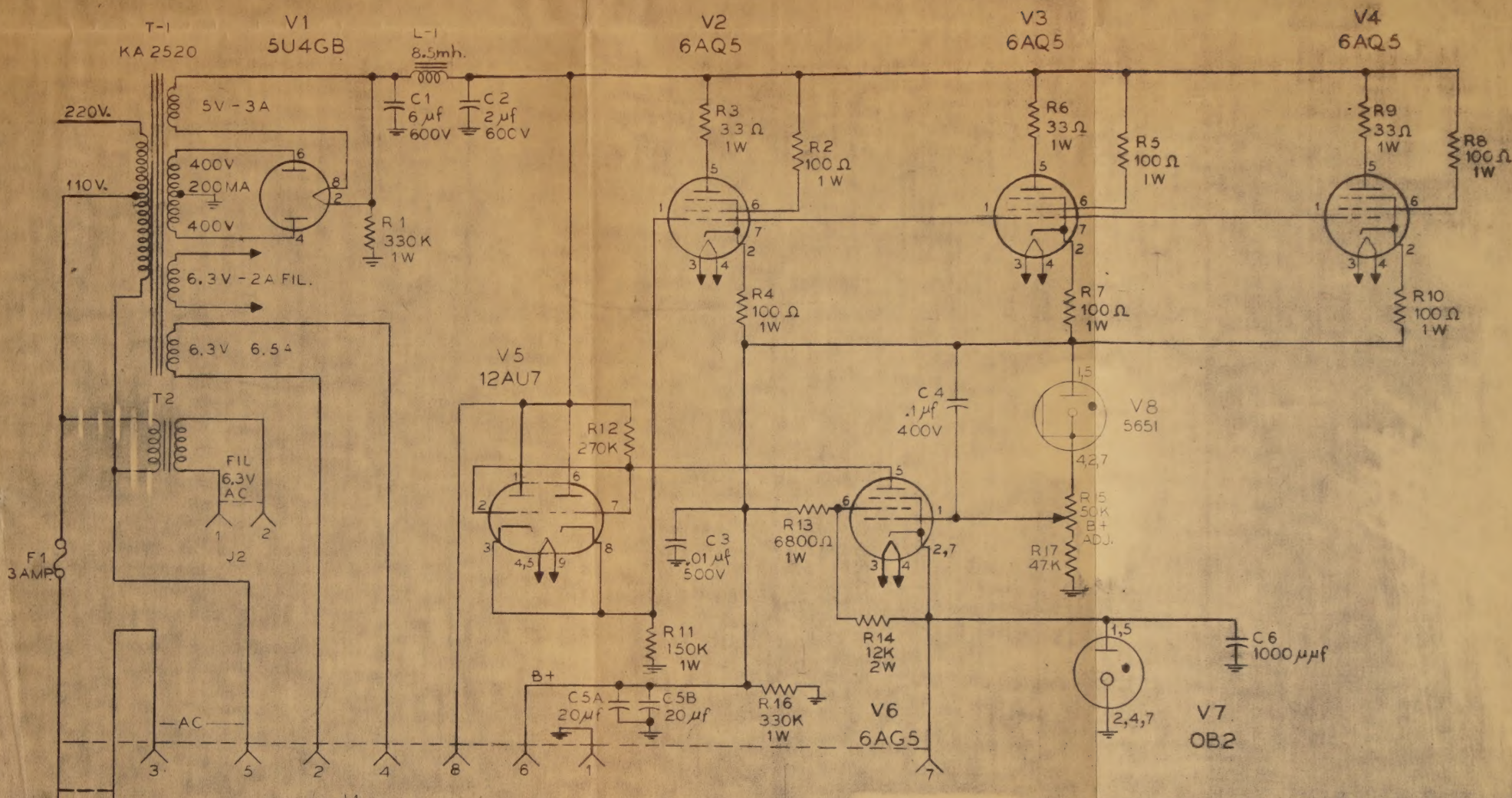
V-1 5U4G
V-2 6AQ5
V-3 6AQ5
V-4 6AQ5
V-5 12AU7
V-6 6AG5
V-7 OB2
V-8 5651

RESISTORS (Unless otherwise specified, all components are fixed composition, 10% tolerance resistors.)

R-1 330K, 1W
R-2 100, 1W
R-3 33, 1W
R-4 100, 1W
R-5 100, 1W
R-6 33, 1W
R-7 100, 1W
R-8 100, 1W
R-9 33, 1W
R-10 100, 1W
R-11 150K, 1W
R-12 270K, ½W
R-13 6.8K, 1W
R-14 12K, 2W
R-15 50K, variable; B+ adj.
R-16 330K, 1W
R-17 47K, ½W, 5%

MISCELLANEOUS

F-1 Fuse; 3A; 250V
L-1 8.5 henry at 200 ma d-c; 120 ohms d-c resistance C1721
T-1 HV-Transformer (KA-2520)
J-1 Jones S-306-AB
P-1 110 VAC Line Plug



T2 FOR UNITS USING 5718 OSC

SCHEMATIC MODEL 200A POWER SUPPLY

MAT. | FINISH: | SCALE:

DIMENSIONS TOLERANCES UNLESS OTHERWISE SPECIFIED:
DECIMAL DIMENSIONS ± .002 FRACTIONAL DIMENSIONS ± .005

CHANGE	DATE	APP.
"G" Redrawn	[illegible]	[illegible]
"H" Revision T-1 added range KA 2526 - 3 and added below E-1. Name and number erased		
"J" L-1 substituted	4-9-54	[illegible]
"K" Correct Plug Connections Pin 7 & 8	2/19/57	TD
"L" added T2	2/7/62	TD
"M" Replaced J 42, with V8 changed R15, R17	11-7-62	TD

KAY ELECTRIC CO.
PINE BROOK, N. J.

DWN. BY AWPIERCE | DATE 11-22-55
APP. BY [illegible] | DATE

DWG. NO. KB 2548-1L

KP-1908 R. S. KNAPP CO., INC. 19208

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